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the beats. This may be accompanied by an increased amplitude of the contractions for a few seconds, but the contractions become diminutive very quickly, and the rapid diminutive beats are followed by a prolonged diastole. The function of the nerve-cord is restored by plasma or sea water.

A. J. CARLSON.

UNIVERSITY OF CHICAGO.

QUOTATIONS.

THE COLLEGE YEAR.

THE beginning of the college year, a month ago, brought several interesting facts under discussion. For instance, in almost every college there was an increase in the number of students—in some colleges a very large increase. The demand for higher training keeps pace with the growth of wealth and population—perhaps outruns it, by mere physical measurement. Endowments and gifts to colleges continue to be made in ever-increasing sums. Yet the demands, especially of the larger universities, become greater every year. Columbia University, in New York City, for instance, has immediate need of more than two millions of dollars; and President Wilson, of Princeton, it will be recalled, formulated a plan of enlargement and improvement, last year, that calls for about twelve millions.

Dr. Alfred G. Mayer, a little while ago, put into concise form in *SCIENCE* the statistics of higher education in the United States, which show that the number of our universities and colleges in 1902 was 638, and the number of students, including graduate students, was 112,433. The number of colleges has increased by 50 per cent., and the number of students by about a hundred per cent., during the decade. But how small a part the college-bred are of the whole population is yet somewhat startling, for they comprise but one in every 700. There were twice as many teachers in 1902 as there were in 1889. The value of college property was multiplied by almost three; the endowment funds were two and a half times as great; gifts for other purposes were nearly three times as great; and the total income, exclusive of benefactions, was

more than trebled. The number of books and libraries was doubled.

In spite of this increased prosperity, the average salary of teachers has probably declined. In one of our largest universities, the average, ten years ago, was \$1,500. It is now only \$1,257. In another one, the average was \$1,454, and now it is \$1,355. This low average has been caused by the engagement of an increasing number of instructors and other subordinate members of the teaching force. The salaries of the professors themselves have not declined, but the increasing proportion of college instruction is now done by subordinate members of the faculties. Sir William Ramsay, during his recent visit to the United States, made more than one plea for increasing the salaries of teachers of high grade.

College training, except in those universities that are maintained by the states, is yet paid for by rich men and dead men. The students, even at those institutions where fees are highest, pay not more than one third of the cost of the training that they receive. It is an industry that must yet be endowed—a fact that hints of its ecclesiastical history. In the perfect economic state, the state will pay for the training of all its children. But we need not yet bother ourselves about the ideal economic state. There is enough work for us to do in training well as large a number of capable youth as possible, at the expense of rich men, living or dead, at the expense of the state, or in any other way, if only enough youth be trained, and be trained well enough.—*The World's Work* for November.

BOTANICAL NOTES.

BOTANY AS A FACTOR IN EDUCATION.

IN a suggestive and helpful article in the October number of the *School Review* Professor J. M. Coulter discusses botany as a factor in education, noticing first its special function in secondary education, and then its general function as a representative scientific study. He says truly that since plants enter very largely into human experience their study 'must relate the pupil to his most common

experiences.' That plants 'reveal the fundamental laws of life,' that they 'are favorable for biological experiment' and that they present opportunities for the study of 'mass phenomena' (ecology, sociology), suggest the culture value of botanical study. As a representative scientific study botany may aid in the cultivation of the scientific spirit, which keeps close to the facts. In commenting upon this, the author says: "We are not called upon to construct a theory of the universe even upon every well-attested fact, and the sooner this is learned the more time will be saved and the more functional will the observing powers remain." "Facts are like stepping-stones; so long as one can get a reasonably close series of them he can make some progress in a given direction." And again, "As one travels away from a fact its significance in any conclusion becomes more and more attenuated. * * * A fact is only influential in its own immediate vicinity." Yet without some corrective training many a man starts with a single well-attested fact and from it constructs an elaborate system. "There is danger of setting to work a mental machine without giving it suitable material upon which it may operate. * * * It may not be that laboratory science in education is the only agency, apart from common sense, which is correcting this tendency; but it certainly teaches most impressively by object lessons which are concrete, and hence easiest to group, that it is dangerous to stray away very far from the facts, and that the farther one strays away the more dangerous it becomes, and almost invariably lends to self-deception."

THE BIRCHES.

HUBERT WINKLER'S contribution to Engler's 'Pflanzenreich' is a notable addition to our knowledge of the birches and their allies. The family (Betulaceae) is divided into two tribes, Coryleae and Betuleae. In the first are the small genera *Ostryopsis* (1 species), *Ostrya* (2 species), *Carpinus* (18 species) and *Corylus* (8 species). In passing we notice that our American *Ostrya* is hereafter to be known as *O. italica* Scopoli, subspecies *virginiana* (Mill.) H. Winkler. In the second tribe the

dominant genera *Betula* (38 species) and *Alnus* (17 species) are figured and described. That the treatment is conservative is shown by the fact that of the 84 species described but 9 are new! These are *Carpinus schuschaensis*, *C. londoniana*, *C. paxi*, *C. stipulata* (all from China), *C. grosserrata* (Persia), *C. hybrida* (Transcaucasia), *Betula luminifera*, *B. baeumkeri* (both from China) and *B. rosae* (Korea). One can not help admiring the author who has the ability to work over a group such as this, and not find it necessary to split up the common species. It is very certain that there are botanists who would have discovered a dozen valid (?) species in *Ostrya italica*, as many more in *Carpinus betulus* and still more in *Corylus avellana*, to say nothing of the possibilities in *Betula* and *Alnus*!

FORESTRY NOTES.

THE 'Forest Manual' is the title of a useful booklet of sixty-four pages issued by the Bureau of Forestry of the Philippine Islands. It contains the forest act which took effect May 20, 1904; extracts from other acts and regulations of the Philippine commission in reference to the forests and their management; lists of native trees; directions for measuring, etc. The United States Bureau of Forestry has issued a bulletin (No. 52) on 'Forest Planting in Western Kansas,' prepared by R. S. Kellogg. After a year or so of careful investigation he says: 'Whatever may be the reasons for the absence of natural forests on the great plains, a close study of established plantations proves that, with an intelligent selection of species and proper care, planted trees can, to a considerable extent, be made to supply the deficiency.' The bulletin abounds in valuable suggestions as to the salvation of species and methods of planting. About twenty-five species are favorably mentioned, including honey locust, osage orange, Russian mulberry, green ash, red cedar, white elm, pines (Scotch and Austrian), black locust, hackberry, cottonwood, box elder, silver maple, black walnut, catalpa, etc.—Bulletin 46 of the Bureau of Forestry is devoted to the growth and management of

the basket willow (by W. F. Hubbard) and Bulletin 53 to the occurrence, soil-requirements and cultivation of the chestnut in southern Maryland. Both papers are well written and must prove very useful.—In the St. Louis World's Fair the Bureau of Forestry has made an outdoor exhibit including a demonstration forest nursery, covering about one fifth of an acre of ground. This valuable exhibit has been made still more valuable by the publication of a descriptive circular (No. 31) in which the plan of the work is clearly explained.—Professor Stanley Coulter and H. B. Dorner have published a handy 'Key to the Genera of the Forest Trees of Indiana,' based chiefly upon leaf characters. It makes a twelve-page pamphlet, which should be very useful to foresters and others interested in trees.—We may close these notes on trees by a reference to a curious book which has lately come to hand, 'The Tree Doctor,' by John Davy. In a book of 87 pages and 167 half-tone photographs, the author gives us a medley of sense and nonsense, good practical advice and suggestion, and wild theorizing, in English which is often quite as unorthodox as his science. The author evidently knows how to grow and care for trees, but he has not succeeded very well in telling us how he does it.

CHARLES E. BESSEY.

THE UNIVERSITY OF NEBRASKA.

INDUSTRIAL EDUCATION IN GERMANY.

MR. ERNST C. MEYER, U. S. Deputy Consul at Chemnitz, writes as follows to the Department of Commerce and Labor in regard to the relative part taken by private initiative and state aid in industrial education in Germany:

It was quite uniformly true that in the establishment of industrial schools private initiative took the lead. The state generally held back until the private schools had proved their usefulness. Then followed a state subsidy and a general supervisory power, and finally most of the industrial schools of higher rank passed over entirely into the hands of the state. The German deserves great credit for his enterprise and discerning powers in the field of industrial education. Many important trade and commercial schools of to-

day were, at the time of their establishment by private individuals, attacked as wild fantasies. Not infrequently state aid was refused, and the individual was compelled to make the best of his own educational views until time vindicated his course. It is not too much to say that to private enterprise probably belongs the greatest credit in the development of Germany's unrivaled system of industrial schools. It was the chambers of commerce, the commercial organizations, the special trade organizations, the guilds, public-spirited benefactors, and men of wide educational discerning powers that contributed most in the construction of the splendid system of industrial schools.

Nor can this reasonably be interpreted as a criticism against the attitude assumed by the state. Records show that this attitude from the first, though not aggressive, was not hostile or condemning, but highly favorable to the establishment of industrial schools. It was probably great wisdom on the part of the state to avoid criticism at a time when criticism against industrial schools was particularly severe, to hold back and let private enterprise prove the value and efficiency of the schools before extending its own powerful aid and protection. To-day every government in the Empire is intensely interested in the welfare of the industrial schools. The time of experimentation as to their value is past. It is now a question of how most economically, most efficiently, and most rapidly to further develop these schools. Though private initiative in the early days broke the way, the state is to-day not delinquent in following out the advantages of early private experience.

The various governments exercise a powerful influence over the organization and work of the industrial schools and the dispensation of their subsidies. The allowance of a subsidy is generally conditioned upon the meeting of certain requirements in organization, entrance requirements, curriculum and grade of work. Schools which conform to the stipulated requirements enjoy financial aid, while others are assured of like aid as soon as the demands of the state are met. By this means it has been possible to introduce great uni-